MISSOURI DEPARTMENT OF NATURAL RESOURCES
AIR AND LAND PROTECTION DIVISION
ENVIRONMENTAL SERVICES PROGRAM
Project Procedures

TITLE: Project Procedure for Wasteload Allocation/Special Stream Studies

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SUMMARY OF REVISIONS: Not applicable. This is a new document.

APPLICABILITY: The procedures outlined in this document apply to all ESP personnel who perform wasteload allocation and other special stream studies.

DISTRIBUTION: MDNR Intranet
ESP, SOP Coordinator

RECERTIFICATION RECORD:

Date Reviewed				
Initials				

1.0 SCOPE AND APPLICABILITY

This document provides Environmental Services Program (ESP) staff with guidance on performing stream studies. Specifically, this document is designed to establish uniform procedures for performing wasteload allocation and other special stream studies. Data acquired from these studies are utilized by the Water Pollution Control Program (WPCP) to determine Total Maximum Daily Loads (TMDLs) for Missouri streams that are considered impaired.

All methods and procedures described herein are in accordance with the Missouri Department of Natural Resources (MDNR) WPCP Quality Assurance Project Plan for Wasteload Allocation Studies.

2.0 PERSONNEL QUALIFICATIONS

Field personnel must have a working knowledge of field sample collection procedures. Staff shall have, at a minimum, attended the department-sponsored Inspection and Enforcement training, basic sampling workshop, or received training from another MDNR employee knowledgeable on proper sample collection procedures. In addition, field personnel should be familiar with all applicable Standard Operating Procedures.

3.0 HEALTH AND SAFETY

3.1 Field activities involved in stream studies will entail working in or around various waste streams (domestic, animal, or industrial). Field personnel should protect themselves by wearing the appropriate level of personal protective equipment such as disposable gloves and waders.

3.2 Personnel should participate in medical monitoring in accordance with the MDNR medical monitoring policy. All field personnel who are routinely exposed to wastewater should be familiar with the Hepatitis A Prevention vaccine policy. Both policies can be reviewed on the MDNR's intranet by accessing the Health and Safety information page.

4.0 GENERAL OVERVIEW

4.1 Under the federal Clean Water Act, the TMDL program provides a framework for identifying and cleaning up impaired waters. Section 303(d) of the law requires states to identify all waters that fail to meet their own water quality standards. These waters remain impaired even though the existing regulatory and permitting requirements have been put in place. The state is required to develop a TMDL for all waters included on this '303(d) list'. The TMDL is a mathematical calculation of the amount of a specific pollutant a waterbody can absorb and still meet water quality

standards. Each TMDL document includes allocations of the acceptable load for all sources of the pollutant. It also includes an implementation plan to identify how the load will be reduced to a level that will protect water quality.

4.2 Impairment of water quality in Missouri streams can be attributed to many pollution sources, both point and non-point. To resolve these problems, a detailed field investigation is often required to define the nature and extent of impairment. These types of field investigations are commonly referred to as wasteload allocations or special stream studies. These studies are typically performed in very localized areas in order to delineate water quality problems.

4.3 Data acquired from wasteload allocation and special stream studies are utilized to determine TMDLs for Missouri streams that have been designated as impaired.

4.4 After management controls have been implemented on an impaired waterbody, it is often necessary to perform additional studies in order to reassess water quality and/or biotic integrity. This allows the WPCP to determine the success or failure of controls that were implemented.

5.0 SAMPLING CONSIDERATIONS

5.1 The WPCP utilize study data to judge attainment of state water quality standards and to develop TMDLs for various water bodies. Results of these studies may have significant financial consequences on industries, municipalities, and agricultural facilities that are located within the subject watershed. Thus, it is crucial that all samples be collected in a manner that provides accurate and representative data for the stream in which they are taken.

5.2 Study requests are included in the QAPP document that is provided to the ESP-Water Quality Monitoring Section (WQMS) by the Water Protection and Soil Conservation Division (WPSCD)-WPCP prior to the beginning of each fiscal year. Typically, these requests specify the source of impairment, data needs, a list of chemical parameters, reporting requirements, and project organization/responsibility. It is common for the WPCP to request several wasteload studies per year.

5.3 Requests are reviewed by the WQMS supervisor or designated personnel for any discrepancies, scheduling issues, or other anticipated problems. In addition, field personnel often make reconnaissance visits to the study site in order to establish sampling locations and alleviate potential problems. Typically, the WQMS supervisor or designee will prepare a study plan that provides sampling locations as well as a more detailed explanation of

how WPCP requirements will be met. These study plans are sent to the WPCP Project Manager for review and approval. All issues are to be brought to the WPCP Project Manager's attention for resolution before the study is initiated.

5.4 In most cases, wasteload allocation studies are performed in mid to late summer, when streams are at annual low-flow conditions. Thus, studies are typically conducted during the period of July 1 through September 15.

6.0 STUDY PREPARATION

6.1 The supervisor of the WQMS or designated personnel will establish a schedule and assign personnel to each requested survey. The designee must determine sampling dates and organize the trip accordingly.

6.2 At least five working days prior to the survey, field personnel will notify the appropriate Regional Office Director that ESP is planning to conduct a sampling event within their region. The following information should be provided:

- When the survey will be conducted
- What stream(s) will be monitored
- What treatment facilities will be sampled

6.3 At least five working days prior to the survey, field personnel will inform the ESP - Chemical Analyses Section (CAS) of the following:

- Number of samples to be delivered
- When samples will be delivered
- Sample parameters
- Method of delivery (hand delivered or shipped)

6.4 Prior to the study, field personnel will determine the type and quantity of supplies, and equipment needed. Field personnel will check all equipment for cleanliness and operation (see MDNR-FSS-001 *Required/ Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations* and MDNR-FSS-201 *Use, Cleaning, and Maintenance of ISCO Automatic Wastewater Samplers*).

6.5 ESP staff often perform a reconnaissance visit to the study site prior to conducting the actual field investigation. In most cases, prior notice should be given to wastewater treatment facilities that are to be sampled. In addition, landowner permission is often required to gain access to sampling sites located on private property. This helps to secure access to necessary areas and facilitates an efficient completion of the project. The

time and date that landowner permission is obtained should be recorded in the field book.

7.0 REQUIRED WEATHER AND STREAM CONDITIONS FOR SURVEYS

7.1 Most wasteload allocation or other special stream studies must be performed during low-flow conditions. Thus, trips should not be made when significant precipitation has occurred recently or is likely to occur.

7.2 In the event that precipitation occurs and stream levels increase during a study, field personnel must determine if the study should continue or be abandoned. This can be a difficult decision involving many factors. Most likely, the study should be terminated and rescheduled if the following conditions occur:

- If turbidity in the stream increases notably.
- If the stream level increases by six inches or more.
- If specific conductivity readings in the stream change by 20 percent or more.

8.0 WASTELOAD ALLOCATION STUDY IMPLEMENTATION

Specific tasks required to implement a special stream study vary widely and it is not possible to include a meaningful description of them in this document. The following items are those which are common for wasteload allocation studies.

8.1 Sampling frequency will be determined by the WPCP. Typically, wasteload allocation studies require two 48-hour surveys. A minimum of three weeks must pass between completion of the first survey and the second, but often they are conducted during consecutive years.

8.2 Wasteload allocation studies are typically performed during a three-day period. Most studies are performed at the beginning of the week in order to allow the ESP-CAS ample time for sample handling.

8.3 Each treatment facility to be sampled should be visited on the first day of the survey. The facility owners/operators should be updated on ESP sampling plans and last minute arrangements can be made to ensure necessary access to the site. After access to the facility has been gained, a cursory facility inspection may be conducted to determine the general operating condition and quality of the discharge. Any unusual conditions that impact effluent quality should be noted and, if deemed necessary by the WQMS Supervisor, reported to the appropriate regional office. In many cases, an ISCO automated sampler is set at the treatment plant outfall during the first day of the survey.

8.4 Stream discharge and transect data are typically measured once at each sampling location during each 48-hour survey. This is performed using methods described in MDNR-WQMS-113 *Flow Measurement in Open Channels.* (Note: It is common for WPCP staff to visit the site and collect additional stream transects and discharge data).

8.5 All other requested parameters are typically measured twice daily, early morning and early afternoon.

9.0 SAMPLE COLLECTION AND FIELD ANALYSIS

9.1 Water samples collected for chemical analysis should be collected according to procedures contained in MDNR-FSS-005 *General Sampling Considerations Including the Collection of Grab, Composite, and Modified Composite Samples from Streams and Wastewater Flows.* All water samples should be taken from the flowing portion of the stream or if in a pool, at least one foot from shore and at least 6 inches below the surface.

9.2 The in-situ analysis of pH, specific conductivity, temperature, and dissolved oxygen are typically required during wasteload allocation studies (see MDNR-FSS-100 *Field Analysis of Water Samples for pH,* MDNR-FSS-102 *Field Analysis of Specific Conductance,* MDNR-FSS-101 *Field Measurement of Water Temperature and* MDNR-WQMS-103 *Sample Collection and Field Analysis for Dissolved Oxygen Using a Membrane Electrode Meter)*.

9.3 Results are recorded on the Field Sheet and Chain-of-Custody Record (see MDNR-FSS-002 *Field Sheet and Chain-of-Custody Record* for additional information).

9.4 It should be noted that early morning dissolved oxygen measurements are typically taken during the period from one hour prior to sunrise to one and one-half hour after sunrise.

9.5 Collection of invertebrate samples shall follow methods described in the Project Procedures (see *Semi-Quantitive Macroinvertebrate Stream Bioassessment*).

9.6 Immediately enter any significant observations made at each sampling site (see MDNR-FSS-004 *Field Documentation*) in the field notebook. At a minimum, the following information should be recorded:

- Sample number (see Section 10.2)
- Date and time of sample collection
- Ambient weather conditions

- Condition of receiving stream
- Land use and condition of the riparian zone
- Color of water sample
- Odor of water sample
- Particulates in water sample
- Sample location
- Any sampler-induced influences on sample representativeness
- Field calibration of instruments
- Field measurements (see Section 9.2)
- Any unusual conditions/observations

9.7 Field instruments should be calibrated at least twice a day, immediately prior to each sampling event. Calibration procedures should be documented in the field notebook. The calibration procedures are contained in the respective SOPs listed earlier in this section.

10.0 SAMPLE HANDLING AND PRESERVATION

10.1 Sample containers, preservation, and holding times must be consistent with procedures contained in MDNR-FSS-001 *Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations*.

10.2 Samples should be numbered by attaching a pre-numbered sample label to one of the sample containers. Other sample containers associated with that sample will receive a hand-numbered label displaying the same sample number as the pre-numbered label. The preservation method should be indicated by circling the appropriate preservative on the label. Samples should be numbered and labeled according to MDNR-FSS-003 *Sample Numbering and Labeling*.

10.3 Chain-of-Custody and field documentation should be completed in accordance with MDNR-FSS-002 *Field Sheet and Chain-of-Custody Record* and MDNR-FSS-*004 Field Documentation*.

10.4 Handling of samples in the field and upon return to the ESP laboratory are outlined in MDNR-FSS-018 *Sample Handling: Field Handling, Transportation, and Delivery to the ESP Lab.*

11.0 QUALITY CONTROL

11.1 As an ESP policy and according to the WPCP QAPP for Wasteload Allocations, collection of duplicate field samples is required on approximately 10 percent of all samples collected. The data collected from duplicate samples will be utilized by the ESP to evaluate analytical precision and repeatability of the field sample collection procedures (see MDNR-FSS-210 *Quality Assurance/Quality Control for Environmental Data Collection*).

11.1.1 Two sets of samples will be collected for the requested analyses; a true sample and a duplicate sample. Analytical results from both sets of samples will be reported to the WPCP in order to determine the precision level achieved by the CAS. In addition, these results are evaluated in-house by ESP staff to determine the repeatability of field collection methods.

11.1.2 A duplicate sample must be collected in the same manner as the true sample.

11.1.3 Trip blanks will be collected in accordance to MDNR-FSS-210 and will accompany every sample to be analyzed for organic parameters.

12.0 SURVEY COMPLETION AND REPORTING

12.1 When returning from a stream study, place all unused supplies and equipment in the appropriate storage areas and clean all used wastewater samplers and other soiled equipment. Mark any malfunctioning equipment and notify the WQMS Supervisor of the necessary repairs.

12.2 Each sample collector shall check the LIMS Viewer within a week following sample delivery to verify that all the information on the Chain-of-Custody was entered correctly by CAS. Any errors should be reported to the CAS immediately.

12.3 CAS will deliver all sampling results to the sample collector. Any errors that are discovered should be reported to the CAS immediately so that corrections can be made.

12.4 The WQMS Supervisor or designated personnel should provide to the WPCP-Project Manager a final report that includes the following:

- All chemical data
- All field analysis data

- Appropriate maps
- Detailed descriptions of each sampling site
- All pertinent comments and field observations
- All stream cross section and discharge data
- All treatment plant flow data
- Any additional analytical data (e.g. diurnal sampling, turbidity data)

13.0 REFERENCES

MDNR-FSS-001 *Required/Recommended Containers, Volumes, Preservatives, Holding Times, and Special Sampling Considerations*

MDNR-FSS-002 *Field Sheet and Chain-of-Custody Record*

MDNR-FSS-003 *Sample Numbering and Labeling*

MDNR-FSS-004 *Field Documentation*

MDNR-FSS-005 *General Sampling Considerations Including the Collection of Grab, Composite, and Modified Composite Samples from Streams and Wastewater Flows*

MDNR-FSS-018 *Sample Handling: Field Handling, Transportation, and Delivery to the ESP Lab*

MDNR-FSS-100 *Field Analysis of Water Samples for pH*

MDNR-FSS-101 *Field Measurement of Water Temperature*

MDNR-FSS-102 *Field Analysis of Specific Conductance*

MDNR-WQMS-103 *Sample Collection and Field Analysis for Dissolved Oxygen Using a Membrane Electrode Meter*

MDNR-WQMS-113 *Flow Measurement in Open Channels*

MDNR-FSS-201 *Use, Cleaning, and Maintenance of ISCO Automatic Wastewater Samplers*

MDNR-FSS-210 *Quality Assurance/Quality Control for Environmental Data Collection*